Title: Probability CHEX©plorations

Brief Overview:

Vocabulary for probability will be introduced: certain, likely, unlikely, and impossible. Students will use these words by experimenting with data and scenarios. Students will enjoy their math experiences as they are creating a recipe, manipulating proportions, and enjoying a sweet treat.

NCTM Content Standard/National Science Education Standard:
Data Analysis & Probability

Grade/Level:
Grades 3-5

Duration/Length:
3 days/ 50-60 minutes

Student Outcomes:

Students will:

- Make predictions, perform a task, record data, and then interpret data.
- Use the data to demonstrate the likelihood of an event happening with the probability meter.
- Take real life data and determine the likelihood of an event happening relaying the information on a probability meter.
- Take a sampling and record data on a table chart
- Create own favorite recipe and make a recipe card

Materials and Resources:

Lesson 1

- Opaque bags (ex. brown lunch bags)
- Colored snap cubes - 6 yellow, 1 blue, 3 red
- Probability meter
- Student Resources 1- 4B
- Teacher Resource 1

Lesson 2

- Chex Mix© or other snack mix, measured out in 2 tablespoons per plastic baggie or Zip Loc® bag
- Calculators-if needed
- Student Resources 5-9
- Sticky© Notes

Lesson 3

- 6 ingredients- example Wheat Chex©, Rice Chex©, Corn Chex©, pretzels, popcorn, peanuts or any other choice you would like
- Plastic baggie or Zip Loc© bag
- Teaspoon for each ingredient
- Student Resource 10
- Teacher Resources 2-4

Development/Procedures:

Lesson 1 Pre-Assessment –

- Distribute opaque bags with the correct cubes to groups of 2-3 students.
- Distribute Student Resource 1.
- Tell students there are 10 cubes with the colors of blue, red and yellow.
- Have students predict the amount of each color of cubes in the bag. The total prediction adds up to 10. Record predictions on the Student Resource 1

Launch-

- As students are making predictions, make sure their predictions are reasonable.

Teacher Facilitation – .

- Work with the students to build their understanding of the concept. For example: *Does your total of all the colors add up to 10? Why can't there be equal amounts of each color? What color do you think will be chosen the most?*

Student Application –

- Without looking, the student will pull 3 cubes from the bag. The results of the colors will be recorded on Student Resource 1 for trial 1. The cubes will be returned to the bag and the procedure will be repeated for trials 2 and 3.
- After 3 trials, the student will look at the data recorded. Predict again the number of each color that is in the bag. They will compare this prediction with the first prediction. Then, they will actually count and record the number of colored cubes on the Student Resource page.

Teacher Facilitation-

- Use the bag/colored cubes experiment as a modeling piece to teach the vocabulary of certain, most likely, equal chance, unlikely and impossible. For example: *Why is it impossible to pull a purple cube from the bag? Is it more likely to pull a blue cube or red cube? Is it less likely to pull a red cube or blue cube?*
- Use the probability meter that you made on the board, or plastic strip on the floor (see Teacher Resource 1) and show where the chances of _____ fall on the meter.

Embedded Assessment –

- Distribute Student Resource 2. Students will work in pairs to answer prompts and together decide where their response would fall on the probability meter. Letters will be written on the meter for recorded responses. Here students will decide and apply the vocabulary words.
- Distribute Student Resource 3. Students will create their own probability investigation bag using 10 cubes.

Re-teaching/Extension –

- **Re-teaching-** For those who have not completely understood the lesson, review what is needed in a small group, reviewing components of the lesson.
- **Extension-**
  Distribute Student Resource 4A and 4B. Students will create their bags of cubes and complete the top only of 4A and all of 4B. Students will cut 4A in half, trade bags with a partner and give the partner the bottom half of 4A for the partner to complete. Then students will trade back bags and paper, and the owners will check the partner's work by comparing the recorded responses at the bottom of 4A to the answer key on 4B.

Lesson 2
Pre-assessment –

- Review vocabulary from lesson 1, including certain, likely, equally likely, unlikely and impossible.
- Distribute Student Resource 5, one per group of 4-5 students.
- Pose questions like *what are the chances of having a snack today?* Students will hold up the appropriate card to respond to the questions. Include questions that will use all 5 words. Students need to come to a consensus as to the correct word card.

Launch –

Today's probability lesson will use Chex Mix©. This will be a whole group activity, modeling the process of today's lessons with student's own Chex Mix©. Distribute a sticky note to each student and have students write their favorite piece of food from a Chex Mix©. Have a temporary word wall with probability words that students can use as a reference.

Teacher Facilitation –

- Distribute Student Resource 6 or 7, depending on the ability level of the students. A transparency should be made of this resource page so students can watch as you model how data is recorded so they can make the same recording on their papers for their data (the upper portion of the student resource page). Use the probability meter to make a prediction which type of Chex Mix© will be more likely in the sample, less likely, etc. Then count the whole pieces, leaving the broken or partial pieces out of the data. Use tally marks and count to complete the "out of" statement portion of the chart, fraction and percent, if appropriate for your class.

Student Application –

- Students will then receive their own bags of Chex Mix©. Instruct students to classify and record the number and type of foods in their bag, using the bottom portion of Student Resource 6 or 7. Students need to complete the table, as was done with the teacher's sample, but use their own data.

Embedded Assessment –

- Distribute Student Resource 8 and have students follow directions on the paper. Collect papers and evaluate the student's success on the activity.

Reteaching/Extension –

- **Reteaching-**With a small group, repeat the activity, using a smaller sample of Chex Mix©, or modify the student resource page as needed for the student.
- **Extension-** Distribute Student Resource 9. Students can combine totals from all 4 students at the table, or find 3 other friends to combine totals following the directions on the resource page. Complete the chart and brief constructed response.

Lesson 3

Preassessment

- Make a transparency of Teacher Resource 2.
  Say: Today I made my favorite Chex Mix©. You will be creating your favorite Chex Mix© for yourself. A minimum of 3 ingredients will be used for your mix, and you can have up to 6 ingredients. By looking at the data on the chart, if 3 out of 24 pieces are pretzels, the probability or relative frequency is 3/24 or 1/8 or 16.5%. Complete the chart modeling the teacher's sample.

Launch –

- Explain the rules for making student's own Chex Mix©. (3 teaspoons equal 1 tablespoon). A total of 6 teaspoons will be used to measure out ingredients, the same amount of Chex Mix© that was used in lesson. Post the rules at the workstation areas where students will measure out the food

for his/her bag. Use Teacher Resource 3 for the recipe guidelines. Making a transparency or poster of the rules may be helpful, or make copies for the workstations.
- Distribute a plastic bag to each student.
- Have students to wash their hands.
- Distribute Student Resource 10.

Teacher Facilitation –
- Monitor food collecting as students are measuring out 6 teaspoons of ingredients, making sure there are at least 3 ingredients used. While groups of students are collecting food, others can begin writing the ingredients on their recipe cards. Having a temporary word wall will help facilitate the spelling of words and choices of ingredients that can be used.

Student Application –
- Students will begin making the recipe as they follow the directions. They will complete the data on the table and recipe card, following the directions on Student Resource 10.

Embedded Assessment –
- Review the student's recipe cards and data table to monitor progress.

Reteaching/Extension –
- **Reteaching**-With small groups of students, provide guidance as needed.
- **Extension**-Check with other classmates to compare recipe cards and see if someone else used the same proportions. Compare counts of ingredients per teaspoon. Make a Chex©cellence Recipe Book for the class, using the information from the recipe cards.

Summative Assessment:

Use Teacher Resource 4, *MSA Brief Constructed Response "Kid Speak" Mathematics Rubric Grades 1 through 8* to determine students' progress with probability using their own Chex Mix© recipes. Note that some children may use words, pictures, numbers, and / or symbols in their answers.

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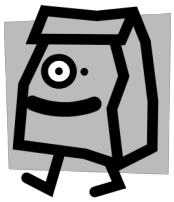


IT'S IN THE BAG!

There are ten cubes in your paper bag. Some are yellow, blue, and red.

Make the following guesses:

1. I think there will be more _____ cubes than any other color.
2. I think there will be fewer _____ cubes than any other color.

Now test your guesses in order to make a better prediction. Pick out three cubes at a time and record the number of each colored cube you selected. Then return the cubes to the paper bag, mix them around, and pick three more until three trials have been completed.

	Yellow	Blue	Red
Trial 1			
Trial 2			
Trial 3			
Total from Trials			

Use the information you gathered to predict how many cubes there are of each color. After you have recorded your prediction, take the cubes out of the bag and count the actual number of each color. Compare the actual with your prediction.

	Yellow	Blue	Red
My Prediction			
Actual Number			

Was your prediction close to the actual number of colors of cubes? Explain why or why not.

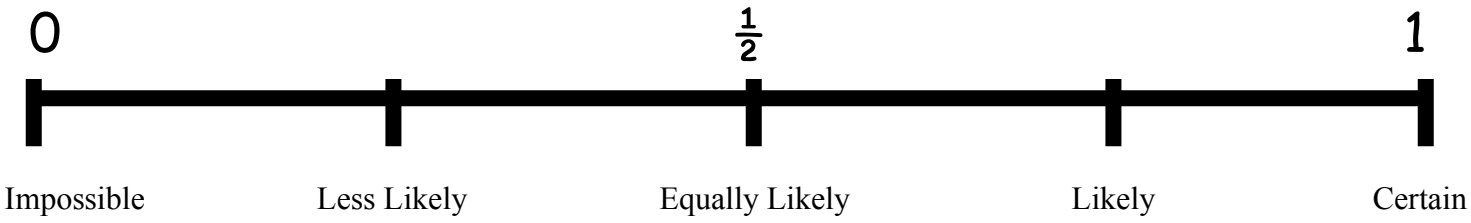
_____

_____

Name: _____ Date: _____

What Are The Chances?

Think about the statements below with a partner. What are the chances these events may occur? Place the letter of each event above the probability meter as it relates to you and your partner. (You may have to compromise!)



Today you will…

A. use a computer

B. tie your shoes

C. drive a car

D. brush your teeth

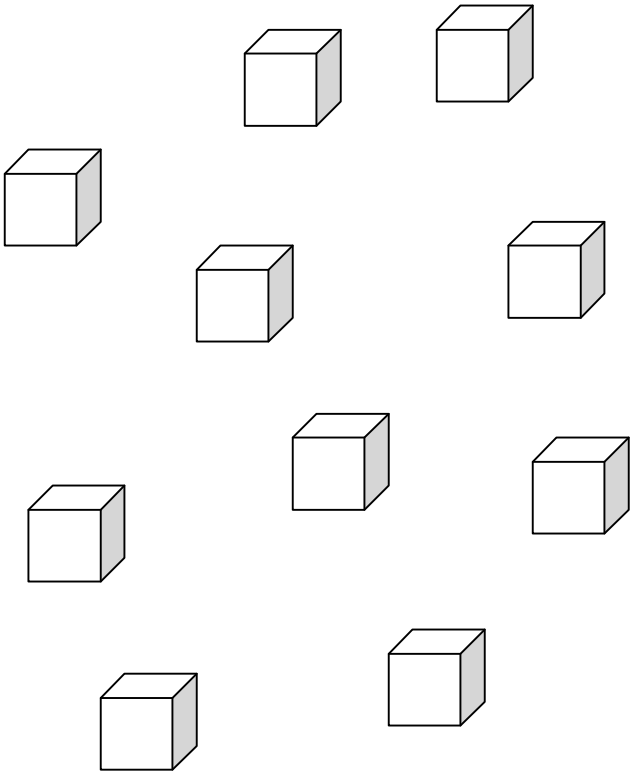
E. get something in the mail with your name on the envelope

Name: _____ Date: _____

Likely and Unlikely

What cubes would you put in the bag?

Use red, blue, and yellow crayons to create a new probability investigation so that your teacher will <u>likely pick blue</u> and <u>unlikely</u> <u>pick red</u> out of your bag.

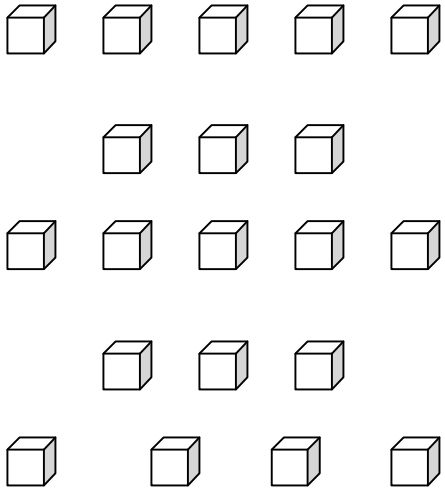


Explain why your teacher will likely pick blue and unlikely pick red from your bag of cubes. Use words, pictures, numbers, or symbols in your answer.

Name: _____ Date: _____

Independent Probability Investigation

Design your own probability investigation for a friend to test. Choose one to four colors for 20 cubes in a paper bag. Color your cubes with your color choices.



Finish the second page for your answer key. Cut the page below for your partner to complete.

Test your partner's probability investigation. Use <u>three or more</u> words from the word box to describe the colors of cubes in your partner's bag.

	Color - _____	Color - _____	Color - _____	Color - _____
Trial 1				
Trial 2				
Trial 3				
Total from Trials				

_____

_____

_____

_____

_____

_____

_____

_____

<u>Word Box</u>

impossible

unlikely

equally likely

likely

certain

Name: _____ Date: _____

Independent Probability Investigation

Student Answer Key

Complete this page so you have the "answers" to check your partner's work after he or she has tested your investigation.

Color				
Number of Cubes				

Use each word from the word box to describe the colors of cubes in your probability investigation bag.

_____

_____

_____

_____

_____

_____

_____

_____

_____

Word Box

impossible

unlikely

equally likely

likely

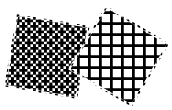
certain

Now go and get your bag and the cubes you need so your friend can try your probability investigation!

Name: _____ Date: _____

Table Group Response Cards:

impossible	less likely
equally likely	likely
certain	

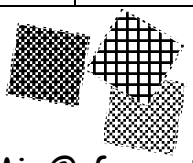


Probability CHEX©plorations

What is the likelihood of picking my favorite piece of Chex Mix© from two tablespoons (tbsp)? Circle your favorite piece of Chex Mix© after the list is written on the table.

Teacher's Chex Mix© (list different pieces)	Tally	Count	Probability	Percent

Probability CHEX©plorations



What is the likelihood of picking my favorite piece of Chex Mix© from two tablespoons (tbsp)? Circle your favorite piece of Chex Mix© after the list is written on the table.

My Chex Mix© (list different pieces)	Tally	Count	Probability	Percent

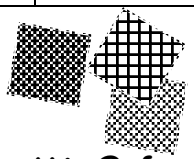
Name: _____ Date: _____

Probability CHEX©plorations

What is the likelihood to pick my most favorite piece of Chex Mix© from two tablespoons (tbsp)? Circle your favorite piece of Chex Mix© after the list is written on the table.

Teacher's Chex Mix© (list different pieces)	Tally	Count	__ out of __	Probability (fraction)

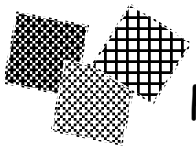
Probability CHEX©plorations



What is the likelihood to pick my most favorite piece of Chex Mix© from two tablespoons (tbsp)? Circle your favorite piece of Chex Mix© after the list is written on the table.

My Chex Mix© (list different pieces)	Tally	Count	__ out of __	Probability (fraction)

Name: _____ Date: _____



Probability CHEX©plorations
Assessment

Your teacher made some delicious, homemade Chex Mix©. In your two tablespoons, you received the following pieces:

Homemade Chex Mix©	Count	__ out of __	Probability (fraction)
pretzels	1		
Rice Chex©	2		
Wheat Chex©	2		
popcorn	1		
chocolate covered candies	4		
Total Pieces			

Complete the chart above showing the probability of selecting the different pieces of Chex Mix©.

What is your favorite piece of Chex Mix© from your teacher's recipe?

_____

Use what you know about probability to explain the likelihood of getting your favorite piece from the two tablespoons above. Use words, numbers, pictures, and / or symbols in your answer.

_____

_____

_____

_____

_____

Name: _____ Date: _____

Totally Chex©ellent!

Can you better your chances of getting your favorite piece of Chex Mix©?

1. Record your Chex Mix© data below.

My Favorite Chex Mix© Piece	Probability of Picking from My Bag

2. Now collect your table group's data and record it in the table.

Chex Mix© Pieces (list all kinds)	My Chex Mix© Pieces	_____'s Chex Mix© Pieces	_____'s Chex Mix© Pieces	_____'s Chex Mix© Pieces	Our Chex Mix© Totals
Total of all Chex Mix© Pieces for our Table Group:					

3. Does the probability of getting your favorite piece of Chex Mix© change when you have a larger sample or larger number of Chex Mix© pieces?

My chance of getting my favorite Chex Mix© piece was…

Circle One:

More Likely Less Likely Equally Likely

Use a fraction, percent, or other way to explain whether or not the probability changed.

_____

_____

_____

Name: _____ Date: _____

_____

____

In one plastic baggie, mix

___ tsp of _____

___ tsp of _____

___ tsp of _____

___ tsp of _____

___ tsp of _____

___ tsp of _____

Chex Mix© (list different pieces)	Tally	Count	Probability (fraction)
	= Total Chex Mix© Pieces		

Recipe Created By: _____

Is there a family member or friend you know who you think would enjoy your Chex Mix© recipe?

Explain why using what you know about probability. Use words, numbers, pictures and / or symbols in your answer.

_____

_____

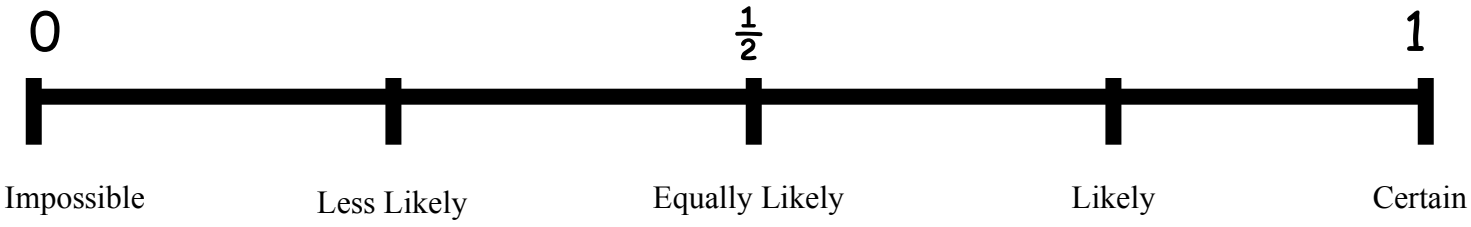
_____

_____

_____

Probability Meter

Enlarge the probability meter on the chalkboard, overhead transparency, or re-create on a large plastic ribbon, sentence strip, or other means to use with your students.



The Most CHEX©ellent Snack Mix

In one plastic baggie, mix

___ tsp of _____

___ tsp of _____

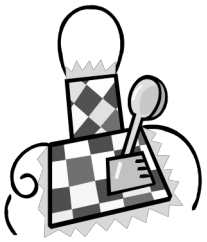
___ tsp of _____

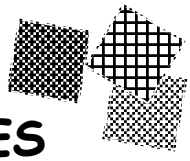
___ tsp of _____

___ tsp of _____

___ tsp of _____

Chex Mix© (list different pieces)	Tally	Count	Probability (fraction)
	= Total Chex Mix© Pieces		





CHEX MIX© KITCHEN GUIDELINES

1. **Hands must be clean.**
2. **Only six teaspoons, <u>total</u>, may be used in your recipe.**
3. **Share teaspoons.**
4. **Return teaspoons to the correct ingredients.**
5. **Clean up any spills you make.**
6. **Return to your seat when you are finished so that another student may create his or her recipe.**

MSA Brief Constructed Response "Kid Speak"
Mathematics Rubric
Grades 1 through 8

Score	
2	**My answer shows I completely understood the problem and how to solve it:** • **I used a very good, complete strategy to correctly solve the problem.** • **I used my best math vocabulary to clearly explain what I did to solve the problem. My explanation was complete, well organized and logical.** • **I applied what I know about math to correctly solve the problem.** • **I used numbers, words, symbols or pictures (or a combination of them) to show how I solved the problem.**
1	**My answer shows I understood most of the problem and how to solve it:** • **I used a strategy to find a solution that was partly correct.** • **I used some math vocabulary and most of my reasons were correct to explain how I solved the problem. My explanation needed to be more complete, well organized or logical.** • **I partly applied what I know about math to solve the problem.** • **I tried to use numbers, words, symbols or pictures (or a combination of them) to show how I got my answer, but these may not have been completely correct.**
0	**My answer shows I didn't understand the problem and how to solve it:** • **I wasn't able to use a good strategy to solve the problem.** • **My strategy wasn't related to what was asked.** • **I didn't apply what I know about math to solve the problem.** • **I left the answer blank.**